ABSTRACT

A step-gradient composite waveguide for evanescent sensing in fluorescent binding assays comprises a thick substrate layer having one or more thin film waveguide channels deposited thereon. In one embodiment, the substrate is silicon dioxide and the thin film is silicon oxynitride. Specific binding molecules having the property of binding with specificity to an analyte are immobilized on the surface of the thin film channels. In preferred embodiments, the composite waveguide further includes light input coupling means integrally adapted to the thin film channels. Such light coupling means can be a grating etched into the substrate prior to deposition of the thin film, or a waveguide coupler affixed to the upper surface of the thin film. The waveguide coupler has a thick input waveguide of high refractive index which receives the laser light through one end and propagates it by total internal reflection. The propagated light is then coupled evanescently into the thin film waveguide across a spacer layer of precise thickness and having an index of refraction lower than either the input waveguide or the thin-film waveguide. The composite waveguide can be constructed by plasma vapor deposition of silicon oxynitride onto the silicon dioxide substrate, masking the channel waveguides with a photoresist, and using reactive ion etching to expose the substrate in the unmasked regions.